Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Nuclear Instruments and Methods in Physics Research B 213 (2004) xviii–xxv
NIM B
Beam Interactions with Materials & Atoms
www.elsevier.com/locate/nimb

Contents

Editorial vii
Committees ix
List of participants xiii
Photos xvi
Contents xviii

Interaction of radiation with matter: fundamental data

Cross section data for electron–positron pair production by photons: a status report
J.H. Hubbell and S.M. Seltzer 1
The γ-ray spectrum of ^{252}Cf and the information contained within it
R.J. Gehrke, R. Aryaeinejad, J.K. Hartwell, W.Y. Yoon, E. Reber and J.R. Davidson 10
Optimization of the steady neutron source technique for absorption cross section measurement by using an ^{124}Sb–Be neutron source
J. Sun and R.P. Gardner 22
Accurate relative γ-ray intensities from neutron capture on natural chromium
T. Belgya and G.L. Molnár 29
Accurate absolute intensities for the ^{35}Cl(n,γ) reaction gamma-ray standard
G.L. Molnár, Zs. Révay and T. Belgya 32
Measurements of neutron capture cross-sections for ADS-related studies
P.M. Milazzo, G. Aerts, E. Berthoumieux, N. Bustreo, D. Cano-Ott, P. Cennini, N. Colonna, C. Domingo, M. Embid, L. Ferrant, E. Gonzales, F. Gunsing, M. Heil, F. Käppeler, S. Marrone, P.F. Mastinu, A. Mengoni, C. Moreau, J. Pancin, T. Papaevangelou, C. Paradela, P. Pavlopoulos, R. Plag, R. Reifarth, C. Stephan, L. Tassan-Got, G. Tagliente, J.L. Tain, R. Terlizzi and V. Vlachoudis 36
Influence of granulation of the sample on the thermal neutron Σ_a measurement
K. Drozdowicz, B. Gabańska, A. Igielski, E. Krynicka and U. Woźnicka 42
Neutron cross-section measurements at the n_TOF facility at CERN
N. Colonna and The n_TOF Collaboration 49
Validation of new electron and positron data libraries
C. Negreanu, J. Stepanek, O.P. Joneja and R. Chawla 55
Energy loss straggling of energetic ^{1}H and ^{2}H ions crossing polypropylene foils
H. Ammi, S. Mammeri and M. Allab 60
Ab initio calculation of the C1s photoelectron spectrum of C_2H_2
R. Colle, D. Embriaco, M. Massini, S. Simonucci and S. Taioli 65
Molecular dynamic analysis of the structure of dendrimers
E. Canetta and G. Maino 71

Interaction of radiation with matter and modelling of radiation transport

Modelling of radiation transport
V.G. Molinari, S. Manservisi, F. Rocchi and F. Teodori 75

doi:10.1016/S0168-583X(03)02077-9

MCNP™ Version 5
R.A. Forster, L.J. Cox, R.F. Barrett, T.E. Booth, J.F. Briesmeister, F.B. Brown, J.S. Bull, G.C. Geisler, J.T. Goorley, R.D. Mosteller, S.E. Post, R.E. Prael, E.C. Selcow and A. Sood 82
A Monte Carlo simulation approach for generating NaI detector response functions (DRFs) that accounts for non-linearity and variable flat continua
R.P. Gardner and A. Sood 87
A new Monte Carlo assisted approach to detector response functions
A. Sood and R.P. Gardner 100
Diffusion of photons with arbitrary state of polarization: the Monte Carlo code MCSHAPE
J.E. Fernandez, V.G. Molinari, M. Bastiano and V. Scot 105
Algorithmic techniques for quantitative Compton tomography
B. Golosio, A. Brunetti and R. Cesareo 108
Monte Carlo simulation of charged particle diffusion through an ionized gas: contributions of simultaneous multiple collisions
V. Molinari and F. Teodori 112
The analog linear interpolation approach for Monte Carlo simulation of PGNAA: The CEARPGA code
W. Zhang and R.P. Gardner 116
Simulating nuclear particle transport in stochastic media using Perlin noise functions
J. Tickner 124
Application of ion transport simulation to the backscattering in α-particle sources
M.J. Vargas, A. Fernández Timón, E. García-Toraño and A. Martín Sánchez 129
Bremsstrahlung emission spectrum for electron microprobe analysis
S. Manservisi, V. Molinari and F. Rocchi 134
Analytical developments in the Wong–Fung–Tam–Gao radiation model of thermal diffusivity
U. Lucia and G. Maino 139
The determination of residence times in a pilot plant
F.P. Ramírez and M.E. Cortés 144
EGS OvrEzy, the object-oriented visual user interface for the EGS particle transport code
A.M. Yacout and W.L. Dunn 149
Study of Compton scattering signals in single-sided imaging applications using Monte Carlo methods
L.M.N. Tavora and W.B. Gilboy 155
The status of the general radiation transport code MCBEND
G.A. Wright, E. Shuttleworth, M.J. Grimstone and A.J. Bird 162
Verification of the pulse height tally in MCNP 5
A. Sood, R.A. Forster, B.J. Adams and M.C. White 167
MCNP optimization of filtered neutron beams for calibration of the SIMPLE detector
C. Oliveira, F. Giuliani, T.A. Girard, J.G. Marques, J. Salgado, J.I. Collar, T. Morlat, D. Limagne and G. Waysand 172
Thermal neutron self-shielding correction factors for large sample instrumental neutron activation analysis using the MCNP code
F. Tzika and I.E. Stamatelatos 177
Comparison and physical interpretation of MCNP and TART neutron and γ Monte Carlo shielding calculations for a heavy-ion ICF system
E. Mainardi, F. Premuda and E. Lee 182
Extension to cylindrical samples of the universal curve of resonance neutron self-shielding factors
I.F. Gonçalves, E. Martinho and J. Salgado 186

Radiation sources and detectors

Liquid metal anode X-ray sources and their potential applications
G. Harding, B. David and J.P. Schlomka 189

Recent advances and future perspectives of position sensitive PMT
R. Pani, R. Pellegrini, M.N. Cinti, M. Mattioli, C. Trotta, L. Montani, G. Iurlaro, G. Trotta, L. D'Addio, S. Ridolfi, G. De Vincentis and I.N. Weinberg 197
Energy spectra measurements of X-ray emission from electron interaction in a dense plasma focus device
A. Tartari, A. Da Re, C. Bonifazzi and M. Marziani 206
Feasibility of an epithermal neutron source for BNCT based on RFQ accelerator
R. Terlizzi, N. Colonna, E. Bisceglie, P. Colangelo, S. Marrone, A. Rainò, G. Tagliente and V. Variale 210
Determination of the photon-contribution of a ^{238}Pu–Be source
S. Mayer, T. Otto and N. Golnik 214
Present and future trends for neutron source calibrations at the National Institute of Standards and Technology
J.M. Adams 218
X-rays spectroscopy with a portable Compton selection chamber: detector design and results
G. Baldazzi, T. Bernardi, J.E. Fernandez, P. Ferrari, P.L. Rossi, G. Testoni and R. Zannoli 223
A new linear array detector for high resolution and low dose digital radiography
M. Bettuzzi, S. Cornacchia, M. Rossi, E. Paltrinieri, M.P. Morigi, R. Brancaccio, D. Romani and F. Casali 227
Description of the response in scintillation crystal arrays: analytical versus statistical approaches
C. Bonifazzi, A. Tartari, M.N. Cinti, L. Nanetti, R. Pellegrini and R. Pani 231
Resolution and sensitivity as a function of energy and incident geometry for germanium detectors
R.M. Keyser 236
Detection quantum efficiency and spatial resolution of neutron CCD-detectors
Ju.N. Barmakov, E.P. Bogolubov, A.P. Koshelev, V.I. Mikerov and V.I. Ryzhkov 241
A new method for signal acquisition and analysis in high radiation environment
S. Marrone 246
A new large area scintillator screen for X-ray imaging
V.V. Nagarkar, S.R. Miller, S.V. Tipnis, A. Lempicki, C. Brecher and H. Lingertat 250
Developments of directional detectors with NaI(Tl)/BGO scintillators
Y. Shirakawa 255
Building a pixellated detector for gamma-ray imaging: the PICsIT example
C. Labanti, G. Di Cocco, G. Ferro, E. Bottacini, F. Gianotti, A. Mauri, E. Rossi, J.B. Stephen, A. Traci, M. Trifoglio and M. Valli 260
X-ray spectrometry with Peltier-cooled large area avalanche photodiodes
L.M.P. Fernandes, J.A.M. Lopes, J.M.F. dos Santos and C.A.N. Conde 267
A comparison between the response of compound semiconductor detectors in single and back-to-back configuration
N. Auricchio, A. Donati, W. Dusi, E. Perillo and P. Siffert 272
HPXe ionization chambers for γ spectrometry at room temperature
S. Ottini-Hustache, C. Monsanglant-Louvet, S. Haan, V. Dmitrenko, V. Grachev and S. Ulin 279
Resistive plate chamber for thermal neutron detection
R. Arnaldi, E. Chiavassa, A. Colla, P. Cortese, G. Dellacasa, N. De Marco, A. Ferretti, M. Gallio, A. Musso, C. Oppedisano, A. Piccotti, F. Poggio, E. Scalas, E. Scomparin, F. Sigaudo and E. Vercellin . . . 284
Phenomenological simulation of detector response for safeguards experiments
M. Marseguerra, E. Padovani, S.A. Pozzi and M. Da Ros 289
Conversion of a X-ray position sensitive detector for use in a thermal neutron tomographic system
M.I. Silvani, R.T. Lopes, E.F.O. de Jesus, G.L. de Almeida, D. Braz and A.F. Barbosa 294
High resolution determination of the spatial distribution of radioisotopes with a digital intensified detector
M. Bettuzzi, F. Ravaioli, R. Rosa, M. Rossi, E. Paltrinieri, M.P. Morigi, R. Brancaccio, D. Romani and F. Casali 300
Ideal response function of a ^{3}He proportional counter to thermal neutrons determined by different length counters
K. Kudo, N. Takeda, A. Uritani, S. Koshikawa, Y. Shibata, K. Kobayashi and T. Yoshimoto 305

Channeltron operating in coincidence mode
Z. Krečak, M. Krčmar, M. Bogovac and A. Ljubičić 310
Radiation damage induced by 2 MeV protons in CdTe and CdZnTe semiconductor detectors
M. Zanarini, P. Chirco, W. Dusi, N. Auricchio, A. Cavallini, B. Fraboni, P. Siffert and M. Bianconi ... 315
Study of light transmittance from layers of Fricke-xylenol-orange-gel dosimeters
G. Gambarini, C. Birattari, M. Mariani, R. Marchesini, L. Pirola, P. Prestini, M. Sella and S. Tomatis 321
Green stimulated luminescence of ZrO_2 + PTFE to UV radiation dosimetry
T. Rivera, J. Azorín, C. Furetta, C. Falcony, M. García and E. Martínez 325
Thermoluminescence (TL) characteristics of perovskite-like $KMgF_3$ activated by La ions
F. Sepulveda, J. Azorin, T. Rivera, C. Furetta and C. Sanipoli 329
Influence of pre-irradiation annealing and Li_x–$Co_{(1-x)}$–O thin film deposition on the TL response of soda lime glass
F.A. Balogun, J.O. Ojo, F.O. Ogundare, S.O. Abulude, M.A. Eleruja, M.K. Fasasi, G.O. Egharevba and E.O.B. Ajayi 333

Production and application of radioisotopes

Radiotracer applications for the analysis of complex flow structure in industrial apparatuses
J. Thýn and R. Žitný 339
Determination of ^{125}I impurities in [^{123}I]labelled radiopharmaceuticals, by liquid scintillation counting: sensitivity of the method
M.L. Bonardi, C. Birattari, F. Groppi, L. Gini, C.H.S. Mainardi and E. Menapace 348
Separation of the alpha-emitting radioisotopes actinium-225 and bismuth-213 from thorium-229 using alpha recoil methods
F.H. Ruddy, A.R. Dulloo, J.G. Seidel and B. Petrović 351
A semi-empirical model for a ^{90}Sr beta-particle transmission thickness gauge for aluminum alloys
R.P. Gardner, W.A. Metwally and A. Shehata 357
Obtaining molybdenum-99 in the IRT-T research reactor using resonance neutrons
A.I. Ryabchikov, V.S. Skuridin, E.V. Nesterov, E.V. Chibisov and V.M. Golovkov 364
Reactivity analysis of solution reactors for medical-radioisotope production
F.J. Souto and R.H. Kimpland 369
Thin-target excitation functions and optimisation of NCA ^{64}Cu and $^{66,67}Ga$ production by deuteron induced nuclear reactions on natural zinc target, for radiometabolic therapy and for PET
F. Groppi, M.L. Bonardi, C. Birattari, L. Gini, C. Mainardi, E. Menapace, K. Abbas, U. Holzwarth and R.M.F. Stroosnijder 373

Nuclear measurements and applications to safeguards, contraband detection, etc.

NMIS plus gamma spectroscopy for attributes of HEU, PU and HE detection
J.T. Mihalczo, J.K. Mattingly, J.S. Neal and J.A. Mullens 378
Cold neutron PGAA facility at Budapest
Zs. Révay, T. Belgya, Zs. Kasztovszky, J.L. Weil and G.L. Molnár 385
Non-destructive interrogation of uranium using PGAA
G.L. Molnár, Zs. Révay and T. Belgya 389
Elemental PGNAA analysis using gamma–gamma coincidence counting with the library least-squares approach
W.A. Metwally, R.P. Gardner and C.W. Mayo 394
Neutron fluence rate measurements in a PGNAA 208-liter drum assay system using silicon carbide detectors
A.R. Dulloo, F.H. Ruddy, J.G. Seidel, S. Lee, B. Petrović and M.E. McIlwain 400

A practical test of a γ–γ coincidence measurement setup for PGAA
P.P. Ember, T. Belgya, J.L. Weil and G.L. Molnár 406
The characterization of legacy radioactive materials by gamma spectroscopy and prompt gamma activation analysis (PGAA)
G.A. English, R.B. Firestone, D.L. Perry, J. Reijonen, B. Ludewigt, K.-N. Leung, G. Garabedian, G. Molnar and Z. Revay 410
An application of gamma/X-ray/weighing methods for the complete in field assay of nuclear materials
G. Brunetti, F.V. Frazzoli, D. Parise, T. Dragnev, R. Abedin-Zadeh, M. Aparo, S. Guardini and A. Ravazzani 414
A unit for inspection of materials using differential gamma-ray scattering technique
N. Chankow and S. Pojchanachai 418
Probe for determination of ash in coal stockpiles
M. Borsaru, J. Charbucinski, A. Rojc, N.D. Thanh and N.T. Tuy 422
A simple technique to improve sensitivity of a β backscatter gauge
N. Chankow, A. Pattarasumunt and C. Po-Lee 426
Isotopic uranium and plutonium analysis by alpha-particle spectrometry
M.P. Rubio Montero, A. Martín Sánchez and A.M. Carrasco Lourtau 429
Hidden substances identification by detection of fast neutron induced γ rays using associated α particle technique
S. Blagus, D. Sudac and V. Valković 434
Method and system based on pulsed neutron generator for fissile material detection in luggage
Ye.P. Bogolubov, S.A. Korotkov, L.A. Korytko, V.G. Morukov, V.I. Nazarov, Yu.G. Polkanov and T.O. Khasaev 439
The soil moisture and its relevance to the landmine detection by neutron backscattering technique
J. Obhođaš, D. Sudac, K. Nađ, V. Valković, G. Nebbia and G. Viesti 445
Detection of explosives and illicit drugs using neutrons
B. Király, T. Sanami, R. Dóczi and J. Csikai 452
Neutron back-scattering sensor for the detection of land mines
E. Fioretto, M. Barbui, S. Giangrandi, M. Cinausero, G. Prete, G. Nebbia and G. Viesti 457
The role of neutron based inspection techniques in the post 9/11/01 era
T. Gozani 460
Experience with a prototype of the Test Ban Treaty monitoring system for air-borne radioactivity
D.F. Measday and E.C.Y. Ho 464

Material testing and NDT

Sherlock Holmes counts the atoms
C. Tuniz, U. Zoppi and M.A.C. Hotchkis 469
High-speed digital radiography using structured CsI screens
V.V. Nagarkar, S.V. Tipnis, V. Gaysinskiy, S.R. Miller and I. Shestakova 476
A radio-optic method for measuring relative motion
W.L. Dunn 481
Low-energy ED-XRF spectrometry application in gold assaying
A. Marucco 486
Use of X-ray computed tomography for the estimation of parameters relevant to the modeling of acoustic scattering from the seafloor
L. Muzi, A.P. Lyons and E. Pouliquen 491
Research on fatigue cracking growth parameters in asphaltic mixtures using computed tomography
D. Braz, R.T. Lopes and L.M.G. Motta 498
Measurements within cloud cavitation by means of X-ray attenuation device
G. Barouch, S. Legoupil, B. Stutz and R. Woo 503

Characterisation of coal and minerals using Compton profile analysis
J. Tickner and G. Roach 507
Impurities and evaluation of induced activity of SiC_f/SiC composites
I.E. Stamatelatos, K. Mergia, G. Lefkopoulos and R. Forrest 511
Contribution of Coulomb excitation techniques in quantitative analysis of materials
L. Craciun, E. Dragulescu, O. Muresan, A.T. Serban and P.M. Racolta 515
Study of diffusion at surface of multilayered Cu/Au films on monocrystalline silicon
C. Benazzouz, N. Benouattas, S. Iaiche and A. Bouabellou 519
Quality control by autoradiography for the thin layer activation technique
N. Manderlier and T. Delvigne 523
The use of prompt gamma activation analysis (PGAA) for the analyses and characterization of materials: Photochromic materials
D.L. Perry, G.A. English, R.B. Firestone, K.-N. Leung, J. Reijonen, B. Ludewigt, G. Garabedian, G.L. Molnar and Zs. Revay 527
In situ determination of sulphur in coal seams and overburden rock by PGNAA
M. Borsaru, M. Berry, M. Biggs and A. Rojc 530
Prompt gamma activation analysis of boron in reference materials using diffracted polychromatic neutron beam
S.H. Byun, G.M. Sun and H.D. Choi 535
Development of an oil-in-soil meter using neutron moderation and microwave attenuation
H. Tominaga, F. Imadate, J. Kawabata, N. Tachikawa, H. Sasaki and H. Yoshida 540
A large area scanning system using 14 MeV neutron tagged beams for non-destructive assays
M. Lunardon, G. Nebbia, S. Pesente, G.M. Romagnoli, G. Viesti, M. Barbui, M. Cinausero, E. Fioretto, G. Prete, G. D'Erasmo, M. Palomba and A. Pantaleo 544

Applications of radiation to medicine and dosimetry

X-ray fluorescence and the study of microcirculation
P. Muthuvelu, R.P. Hugtenburg, D.A. Bradley and C.P. Winlove 548
Anomalous Rayleigh scattering with dilute concentrations of elements of biological importance
R.P. Hugtenburg and D.A. Bradley 552
Effect of gallium on in vitro aortic valve cusp mineralization – EDXRF studies
A. Wróbel, G. Goncerz, J. Kunz, P. Podolec and E. Rokita 556
Optimization of an in vivo X-ray fluorescence mercury measurement system
J.M. O'Meara, J. Börjesson, D.R. Chettle and F.E. McNeill 560
A synchrotron XRF study on trace elements and potassium in breast tissue
K. Geraki, M.J. Farquharson, D.A. Bradley and R.P. Hugtenburg 564
Elemental mapping of teeth using μSRXRF
M.J. Anjos, R.C. Barroso, C.A. Pérez, D. Braz, S. Moreira, K.R.H.C. Dias and R.T. Lopes 569
Preliminary studies on K and L coincidence spectroscopy for optimizing the in vivo XRF measurement of lead in bone
W. Guo, R.P. Gardner and W.A. Metwally 574
A study of MDL improvement for the in vivo measurement of lead in bone
H. Nie, D. Chettle, I. Stronach, M. Arnold, S. Huang, F. McNeill and J. O'Meara 579
Determination of lead in blood by TXRF and its correlation to environmental lead
T. Martinez, J. Lartigue, P. Avila-Perez, G. Zarazua, L. Cabrera, S. Tejeda and A. Ramirez 584
Distribution and chemical state analysis of iron in the Parkinsonian substantia nigra using synchrotron radiation micro beams
A. Ide-Ektessabi, T. Kawakami and F. Watt 590
Measurements of X-ray scatter signatures for some tissue-equivalent materials
M.E. Poletti, O.D. Gonçalves and I. Mazzaro 595

The effect of lead in bone densitometry
M. Popovic, F.E. McNeill, C.E. Webber and D.R. Chettle 599
Dual energy imaging in mammography: Cross-talk study in a Si array detector
G. Baldazzi, D. Bollini, M. Gambaccini, M. Gombia, L. Ramello and A. Tuffanelli 603
Feasibility of X-ray interstitial radiosurgery based on plasma focus device
A. Tartari, A. Da Re, F. Mezzetti, E. Angeli and P. De Chiara 607
Feasibility analysis of a Plasma Focus neutron source for BNCT treatment of transplanted human liver
V. Benzi, F. Mezzetti, F. Rocchi and M. Sumini 611
An electron beam imaging system for quality assurance in IORT
F. Casali, M. Rossi, M.P. Morigi, R. Brancaccio, E. Paltrinieri, M. Bettuzzi, D. Romani, M. Ciocca, G. Tosi, C. Ronsivalle and M. Vignati 616
Selective perturbation of in vivo linear energy transfer using high-Z vaginal applicators for Cf-252 brachytherapy
M.J. Rivard, K.E. Evans, L.C. Leal and B.L. Kirk 621
Remote afterloading for intracavitary and interstitial brachytherapy with californium-252
T. Tačev, G. Grigorov, T. Papírek and V. Kolařík 626
Californium-252 versus conventional gamma radiation in the brachytherapy of advanced cervical carcinoma: comparative treatment results of a 10-year, randomized study
T. Tačev, V. Strnad and B. Ptáčková 629
Procedural and practical applications of radiation measurements for BNCT at the HFR Petten
R.L. Moss, F. Stecher-Rasmussen, J. Rassow, J. Morrissey, W. Voorbraak, W. Verbakel, K. Appelman, G.G. Daquino, L. Muzi, A. Wittig, E. Bourhis-Martin and W. Sauerwein 633
Development of a treatment planning system for BNCT based on positron emission tomography data: preliminary results
N. Cerullo, G.G. Daquino, L. Muzi and J. Esposito 637
Spectrum shaping assessment of accelerator-based fusion neutron sources to be used in BNCT treatment
N. Cerullo, J. Esposito and G.G. Daquino 641
Dose responses of diamond detectors to monoenergetic X-rays
Z. Yin, R.P. Hugtenburg, S. Green and A.H. Beddoe 646
Recombination index of radiation quality of low-LET radiation
N. Golnik, S. Mayer and M. Zielczyński 650
Calculation of effective dose from external exposure to photons for the Male Adult voXel (MAX) phantom
J.W. Vieira, R. Kramer and F.R.A. Lima 654
Dosimetric control of ^{90}Sr–^{90}Y source trains for endovascular brachytherapy by radiochromic film
F. Tondeur, I. Gerardy, J. Guillaume and M. Van Dycke 658
Monte Carlo simulation for dose distribution calculations in a CT-based phantom at the Portuguese gamma irradiation facility
C. Oliveira, H. Yoriyaz, M. Carmo Oliveira and L.M. Ferreira 662
In-phantom dose mapping in neutron capture therapy by means of solid state detectors
S. Baccaro, A. Cemmi, C. Colombi, M. Fiocca, G. Gambarini, B. Lietti and G. Rosi 666

Applications of radiation to cultural heritage and environment

The use of radiation for the study of material of cultural heritage significance
D.C. Creagh and V. Otieno-Alego 670
Paintings – high-energy protons detect pigments and paint-layers
A. Denker and J. Opitz-Coutureau 677
Radiation applications in art and archaeometry X-ray fluorescence applications to archaeometry. Possibility of obtaining non-destructive quantitative analyses
M. Milazzo 683

A compact μ-XRF spectrometer for (in situ) analyses of cultural heritage and forensic materials
G. Vittiglio, S. Bichlmeier, P. Klinger, J. Heckel, W. Fuzhong, L. Vincze, K. Janssens, P. Engström, A. Rindby, K. Dietrich, D. Jembrih-Simbürger, M. Schreiner, D. Denis, A. Lakdar and A. Lamotte 693
Energy dispersive X-ray fluorescent (ED XRF) analyzer X-Art for investigation of artworks
A.S. Serebryakov, E.L. Demchenko, V.I. Koudryashov and A.D. Sokolov 699
Portable equipment for energy dispersive X-ray fluorescence analysis of Giotto's frescoes in the Chapel of the Scrovegni
R. Cesareo, A. Castellano, G. Buccolieri, S. Quarta, M. Marabelli, P. Santopadre, M. Leole and A. Brunetti 703
Investigation of defects in Fresco substrates by means of the ECoSp imaging system and the principal component image analysis
C. Bonifazzi, E. Lodi, G. Maino, V. Muzzioli, L. Nanetti, N. Ludwig, M. Milazzo and A. Tartari ... 707
Multivariate image analysis of ECoSp Compton spectra
C. Bonifazzi, E. Lodi, G. Maino, V. Muzzioli, L. Nanetti and A. Tartari 712
Spread of façon-de-Venise glassmaking through central and western Europe
Ž. Šmit, K. Janssens, O. Schalm and M. Kos 717
Determination of localized Fe^{2+}/Fe^{3+} ratios in inks of historic documents by means of μ-XANES
K. Proost, K. Janssens, B. Wagner, E. Bulska and M. Schreiner 723
Study of inks on paper engravings using portable EDXRF spectrometry
J.L. Ferrero, C. Roldán, D. Juanes, J. Carballo, J. Pereira, M. Ardid, J.L. Lluch and R. Vives 729
X-ray fluorescence in research on Czech cultural monuments
T. Čechák, J. Gerndt, I. Kopecká and L. Musílek 735
EDXRF study of Prehistoric artefacts from Quinta do Almaraz (Cacilhas, Portugal)
M.F. Araújo, L. de Barros, A.C. Teixeira and A.Á. de Melo 741
MicroCT Scan in paleobiology: application to the study of dental tissues
M. Rossi, F. Casali, D. Romani, L. Bondioli, R. Macchiarelli and L. Rook 747
Dating sediment deposits on Montalvanian carvings using EPR and TL methods
M.D. Sastry, H.S.L. Sullasi, F. Camargo, S. Watanabe, A.P.P. Prous and M.M.C. Silva 751
Irradiation for dating Brazilian fish fossil by thermoluminescence and EPR technique
H.S. Sullasi, M.B. Andrade, W.E.F. Ayta, M. Frade, M.D. Sastry and S. Watanabe 756
Application of synchrotron radiation microbeams to environmental monitoring
A. Ide-Ektessabi, K. Shirasawa, A. Koizumi and M. Azechi 761
Laboratory scale studies on mitigation of high ^{222}Rn concentrations in air and water
A. Mamoon, M.A. Gomma and M. Sohsah 766
Air pollution biomonitoring survey in Morocco using k_0-INAA
T. El Khoukhi, R.M. Cherkaoui, A. Gaudry, S. Ayrault, A. Senhou, A. Chouak, Z. Moutia and E. Chakir 770
Monitoring the radon flux from gold-mine dumps by γ-ray mapping
R. Lindsay, R.J. de Meijer, P.P. Maleka, R.T. Newman, T.G.K. Motlhabane and D. de Villiers 775
Modelling the dispersion of ^{137}Cs in marine ecosystems with Monte Carlo methods
M. Toscano-Jimenez and R. García-Tenorio 779
TRXRF analysis of environmental lead and heavy metals to monitor pollution in Caracas, Venezuela
S.M. Suarez, L. Sajo-Bohus, E.D. Greaves, J.R. Dominguez V and E. Villar 784

Author index 789